EFFECTS OF INTERIM FLOWS FROM GLEN CANYON DAM ON THE AQUATIC RESOURCES OF THE LOWER COLORADO RIVER FROM DIAMOND CREEK TO LAKE MEAD

Quarterly Report No. 6
(Trip No. 6: September 28 - October 10, 1993)

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INTRODUCTION

This report presents pertinent details associated with Trip 6, 1993 of the Hualapai Aquatic Resources Study. Included in the report are a summary of trip logistics, personnel, data collected, observations, problems encountered, and recommendations. Most information is presented in a tabular format to provide a quick synopsis of trip details and results. We emphasize that these data are hand tabulated and should be considered preliminary. The data will subsequently be computerized and checked for accuracy. The purpose of these trip reports is to provide information from BIO/WEST, Inc. trips as quickly as possible to aid other researchers.

LOGISTICS, RESEARCH SCHEDULE, AND PERSONNEL

Trip 6 was conducted from September 28 through October 10, 1993, from Diamond Creek (river mile [RM] 225.7) to Pearce Ferry (RM 280) on Lake Mead. Five campsites were established and sampling was conducted in the areas indicated in the schedule shown in Table 1. Sampling was also conducted in Diamond Creek near the launch site. The Colorado River near Travertine Falls was moderately swift and deep with fast runs and eddies. The river near Spencer Canyon had a slightly lower gradient, and was lined with vertical cliffs, talus slopes, and emergent shoreline vegetation. The river above Salt Creek was slow with a greater degree of meandering and banks lined with heavily-vegetated lake sediment. Because sampling in this portion of river was conducted under low-flow conditions, exposed sandbars were common in the channel. The river in the area of RM 265 was still slower and banks were lined with dense stands of willows and other riparian vegetation. The campsite on Lake Mead was located on Scorpion Island adjacent to the river inflow. Although some nets were set in a large bay east of Pearce Ferry, the majority of sampling in the lower river was from the border of the Hualapai Reservation (RM 273.5) to the vicinity of the Grand Wash Cliffs (RM 276.5). Inundated riparian vegetation, travertine cliffs, and little or no current characterized the river near the inflow.

Table 2 is a list of personnel who participated in research activities for Trip 6, 1993.

DATA COLLECTED

Fish

A summary of fish-sampling effort by gear type is presented in Table 3. Trammel nets and electrofishing (EL 220v DC) were employed in the main channel of the Colorado River, and a small number of trammel nets were set in Lake Mead. Overall, nets appeared to be a more effective means of sampling adult fish than electrofishing. Minnow trapping and backpack electrofishing were only employed in tributaries, and seining was used in both the main channel and tributaries. All three techniques employed in tributary streams were highly effective for sampling young-of-the-year and juvenile fishes. However, in many cases seining proved to be marginally effective for sampling adult fish (primarily carp).

A multiple-pass removal technique was applied in Spencer Creek to provide a more quantitative estimate of fish abundance. Multiple-pass sampling was conducted in approximately the same locations as during Trip 5; slight differences in location were due to changes in channel configuration that resulted from flooding that occurred between the two trips. A section of stream was selected near the confluence with the mainstem Colorado River (Site 1). This

segment of stream was 29.6 m long, with an average width of 5.3 m. An additional site (site 2) approximately 0.75 miles upstream was also sampled with the backpack electrofishing unit (3-pass removal). This site was 46.0 m long and had an average width of 10.7 m. To preclude the escape of fish from the area being sampled, block nets were set at both the upstream and downstream ends of each site. Electrofishing (using a backpack electrofishing unit), was initiated at the downstream end of the site, and proceeded to the upstream block-net. This process was repeated three times, and fish captured on different passes were stored in separate containers.

In addition to the multiple-pass sampling, four qualitative electrofishing samples were collected in Spencer Creek. These samples were taken in the section of Spencer Creek from approximately 100 m to 1.5 miles upstream of site 2. All sampling locations were noted on a 7.5 minute USGS quadrangle map.

Fish species composition was very different from that reported on the previous trip in May-June (Trip Report No. 5). The relative abundance of native species increased from 2 percent of total catch during Trip 5 to 16 percent during Trip 6 (total numbers of each fish species captured during Trip 6 are shown in Table 4). This was due primarily to increases in the number of speckled dace and flannelmouth sucker. In addition, a single humpback chub and one bluehead sucker were also captured; this is the first time during this study that either of these species had been encountered. The chub, captured at RM 253.2, was an adult female (TL 329 mm, 293 g) that appeared to be healthy and in good condition. The chub was captured in a trammel net at the break point of one of the strongest eddies in the vicinity of Salt Creek. The habitat was very similar to that occupied by chub near the Little Colorado River. The location of capture was photographed so that the habitat could be compared to capture locations in other sampling reaches.

The abundance of several exotic species in our sampling areas appeared to have changed since Trip 5. The total number of channel catfish and carp sampled during Trip 6 was approximately 4 and 8 percent, respectively, of that sampled during Trip 5. In addition fewer striped bass were captured in the main channel. During Trip 6, we captured only two striped bass: in the main channel (RM 273.2), and in Lake Mead (RM 278.5). It appears that striped bass have moved out of the river and returned to Lake Mead; this may also be true for channel catfish.

The shift from exotic to native species was especially pronounced in Spencer Creek. During the May-June trip large numbers of catfish and carp were encountered, but during Trip 6 few carp and no catfish were captured (Table 5). The large number of small (native and exotic) fishes captured during September-October may be related to the decline in the abundance of larger fish (especially the highly piscivorous catfish).

Of the native species captured during this trip, only eight were adults. PIT-tags were implanted in these individuals. All other individuals were juveniles and were too small to be tagged. No previously tagged flannelmouth suckers were recaptured during this trip. The endangered razorback sucker (Xyrauchen texanus) was not captured or observed during Trip 6 or any previous trips. The following is a list of individual fish PIT-tagged during Trip 6.

Species	PIT-tag	RM	TL (mm)	Weight (g)	Sex
Humpback chub	1F1F74212D	253.2	329	293	F
Bluehead sucker	1F20031B23	229.0	249	161	U
Flannelmouth sucker	1F1E2D3264	227.7	380	481	F
Flannelmouth sucker	1F200E7241	230.5	228	108	M
Flannelmouth sucker	1F1E2B1107	230.5	294	206	M
Flannelmouth sucker	1F1F5B7077	230.7	387	491	F
Flannelmouth sucker	1F0C701F46	274.0	410	639	F
Flannelmouth sucker	1F0F642747	273.8	346	363	F

Water Quality

Water quality parameters were measured with a Hydrolab Surveyor 3 at each campsite and in Spencer Creek. This instrument recorded water temperature, pH, conductivity, and dissolved oxygen at 30-minute intervals. In addition, a thermograph (Ryan Instruments Tempmentor) was deployed in the Colorado River (RM 229.7) below Travertine Canyon to provide a long-term record of temperature fluctuations in this section of the river. The thermograph was set to record temperatures at 2-hour intervals. The two thermographs deployed in June (in Spencer Creek and in the main channel near the confluence with Spencer Creek) were checked for debris build-up. These two thermographs were set to record temperature at 15-minute intervals.

Temperatures recorded by the Surveyor 3 ranged from 14.6 to 15.5°C in the Colorado River above Spencer Canyon. In Spencer Creek, temperatures were higher ranging from 18.4 to 26.5°C over a 48-hour period. Downstream of Spencer Creek main channel temperatures were similar to those measured further upstream ranging from 14.9 to 15.9°C. Finally, temperatures recorded in Lake Mead near Scorpion Island ranged from 16.5 to 18.2°C.

Turbidity in the main channel was high for the first two days of the trip. After this, decreases in flow led to lower levels of turbidity until 9 October when an increase was observed in response to upstream flooding events.

Primary/Secondary Productivity

Two sets of drift samples were taken by Hualapai biologists in the Colorado River during Trip 6. One set was taken above Spencer Creek (RM 245.2), and the other at RM 253.9. Both sets of samples were collected from the right side of the river channel.

Stream benthos were collected with a Surber sampler in Travertine Falls Creek and Diamond Creek, and five Hess samples were taken near the mouth of Spencer Creek. Plankton tows and incidental algae and invertebrate samples were collected from the main channel, Spencer Creek, Travertine Falls Creek, and Surprise Creek. Finally, two Ekman-dredge samples were taken in

the eddy where the humpback chub was captured; neither of these samples contained invertebrates.

River Stage Monitoring

Three new temporary benchmarks (TBM) were established at the following locations: RM 230.5 (left), RM 246.0 (mouth of Spencer Creek-left), and RM 253.2 (the site of the humpback chub capture - right). Changes in stage were measured at each of these locations. River level was also monitored at a previously established TBM at RM 245.1 (right). Two transects were established near the mouth of Spencer Creek to assess the impact of river fluctuations on habitat at the confluence. Depths and velocities were measured at 1-foot intervals along these transects at two different river levels.

Mapping

All sites in Spencer Creek were located on a 7.5 minute USGS quadrangle map. The eddy in which the chub was captured was mapped (freehand) to document habitat conditions. In addition, this eddy was also located on a USGS quadrangle map.

OBSERVATIONS

1. Fish density was again much greater in Spencer and Surprise Creeks than in the main channel of the Colorado River. Fish may be entering these streams in response to differences in water quality or food availability associated with the tributary mouths.

2. As expected, fish spawning activity in the lower Colorado River has ceased. No ripe fish or fish with spawning coloration (primarily red shiners) were observed.

3. Speckled dace were observed in Travertine Falls Creek near the confluence with the main channel. Nonetheless, this tributary is very small and undoubtedly supports very few fish.

4. Densities of tadpoles (larvae of canyon tree frogs and red-spotted toads) had declined greatly in Spencer Canyon and other tributaries since the previous sampling trip. We assume that the majority of these matured to adults.

5. Minor flooding had taken place during the summer months in Spencer and Surprise Creeks. Spencer Creek had been reconfigured so that some areas that had previously been characterized by a confined channel were now braided, and vice versa. The slough (large terminal pool) area near the mouth of Surprise Creek was much larger than during the previous trip and sediment accumulation was apparent in some locations further upstream.

6. Flow was lower in Spencer and Surprise Creek and may have been at a level representing base-flow conditions in these streams. Lower flow (i.e., turnover) in pools in Surprise Creek has resulted in a reduction in water clarity associated with higher levels of primary production.

7. Diamond Creek is heavily disturbed due to traffic associated with the boat launch. In fact, in many locations the road constitutes the entire streambed. As expected, few fish and invertebrates were collected in Diamond Creek above the inflow.

PROBLEMS ENCOUNTERED

1. Only one Coffelt CPS unit functioned during the trip and this unit had a malfunctioning timer. Sampling times were estimated by subtracting 5 minutes to account for active electrofishing time from the total elapsed time to account for active electrofishing time. The CPS units have been returned to Coffelt for repair.

2. The Coffelt backpack electrofishing unit overheated repeatedly and had to cool between runs to maintain sampling effectiveness. This unit has also been sent to Coffelt Electronics for repair.

RECOMMENDATIONS

- Continue intensive sampling of Spencer Creek including multiple-pass and incidental fish sampling.

- Attempt to collect transect data at the mouth of Spencer Creek at 4 different water elevations.

- Increase the number of shoreline seine hauls in the main channel.

- Continue to sample the area where the humpback chub was collected, as well as similar habitats in other locations.

- Continue to sample in Diamond Creek, concentrating on the confluence with the main channel.

Table 1. Dates, campsites, and sample locations for Trip No. 6, September 28 - October 10, 1993.

Date	Camp Site	Sample Locations
Sept 28 - 30	Travertine Falls (RM 230.5)	RM 227.5 - 230.7
Sept 30 - Oct 4	Above Spencer Creek (RM 245.2)	RM 242.5 - 249.1 including Spencer Creek (RM 246), Surprise Creek (RM 248.4), and the mouth of Lost Creek (RM 248.4)
Oct 4 - 7	Above Salt Creek (RM 253.9)	RM 252.9 - 260 including the mouth of Quartermaster Creek (RM 259.9)
Oct 7 - 9	Scorpion Island (RM 279)	RM 273 - 278.5
Oct 9 - 10	Pearce Ferry (RM 280)	Derig

RM = River Mile

Table 2. Personnel participating in Trip No. 6, September 28 - October 10, 1993.

Personnel	Affiliation	DATES
Gloria Hardwick	BIO/WEST, Inc.	09/28 - 10/10
Randall Filbert	BIO/WEST, Inc.	09/28 - 10/10
Teresa Yates	BIO/WEST, Inc.	09/28 - 10/10
Morris Sampson	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	09/28 - 10/10
Alvin Dashee	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	09/28 - 10/10
Warren Powsky	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	09/28 - 10/10
Johnny Matuck	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	09/28 - 10/10
Curtis Hansen	OARS	09/28 - 10/10
Bob Grusy	OARS	09/28 - 10/10
Elizabeth Fuller	OARS	09/28 - 10/10

Table 3. Fish sample gears, codes, descriptions, and number of samples from the Lower Grand Canyon and Lake Mead.

SAMPLE GEAR CODE - DESCRIPTION	TOTAL NUMBER SAMPLES
Electrofishing	
EL - 220-v DC (Coffelt CPS)	29
EL - Backpack Coffelt	6
Trammel Nets	
TK - 75'x6'x1"x12"	23
TL - 75'x6'x1.5"x12"	30
TM - 50'x6'x1"x12"	23
TN - 50'x6'x1.5"x12"	14
Minnow Traps	
MT - commercial minnow traps	24
Seines	
SA - 10'x3'x1/8" seine	21
Total	170

Table 4. Numbers of fish by species captured during Trip No. 6 in the Lower Grand Canyon and Lake Mead inflow.

FAMILY COMMON NAME (Code)	SCIENTIFIC NAME	TOTAL CAPTURED
CYPRINIDAE (minnows)		
red shiner (RS)	Cyprinella lutrensis	2,813
fathead minnow (FH)	Pimephales promelas	179
common carp (CP)	Cyprinus carpio	27
humpback chub (HB)	Gila cypha	1
speckled dace (SD)	Rhinichthys osculus	515
CATOSTOMIDAE (suckers)		
flannelmouth sucker (FM)	Catostomus latipinnis	49
bluehead sucker	Catostomus discobolus	1
PERCICHTHYIDAE (temperate basses)		
striped bass (SB)	Morone saxatilis	2
ICTALURIDAE (catfishes)		
channel catfish (CC)	Ictalurus punctatus	7
POECILIIDAE (livebearers)		
mosquitofish (GA)	Gambusia affinis	4
CYPRINODONTIDAE (killifish)		
plains killifish	Fundulus zebrinus	8
CENTRARCHIDAE (sunfishes)		
black crappie (BC)	Pomoxis nigromaculatus	1
bluegill (BG)	Lepomis macrochirus	1
TOTAL		3,608

Table 5. Numbers of fish by species captured during multiple-pass sampling in Spencer Creek, Trip 6, 1993.

Fish species	Site 1 (downstream)	Site 2 (upstream)
Speckled dace	163	181
Red shiner	114	721
Fathead minnow	-	34
Common carp	-	3
Flannelmouth sucker	-	24
Total	277	963